Short communication

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The results of integrated monitoring of the Pravdinsk reservoir (Kaliningrad region)

Dmitrieva O.A., Semenova A.S., Chukalova N.N., Shukhgalter O.A., Rodjuk G.N., Gusev A.A., Poddueva E.A., Rudinskaya L.V., Vasukevich N.A., Pijanov D.S., Dubova O.L.

Atlantic branch of the Russian Federal Research Institute of Fisheries and Oceanography "VNIRO" ("AtlantNIRO"), 5, Dmitry Donskoy Str., Kaliningrad, 236022, Russia

ABSTRACT. As a result of a study of the Pravdinsk reservoir, it was found that the radiation situ ation can be estimated as safe. According to microbiological indicators, the water quality was assessed as polluted with β, α-mesosaprobic, 3–4 classes of water quality. During the "bloom" of water by Cyanobacteria, we observed the toxic effect on the test organisms D*aphnia magna* and C*eriodaphnia affinis,* in this period the consumption of phytoplankton by zooplankton was low. According to benthos biomass, the reservoir is assessed as a water body with a high food value. The ichthyofauna included 14 species of fish that belonged to families of Cyprinidae, Percidae, Gadidae and Esocidae. 11 species of parasites related to Microsporidia, Myxosporidia, Trematoda, Cestoda, Hirudinea and parasitic Crustacea were found. Metatercaria of trematoda A*pophallus müehlingi* pathogenic for humans were found in roach and perch.

Keywords: Pravdinsk reservoir, microbiological indicators, phytoplankton, zooplankton, benthos, ichthyofauna, fish parasites.

1. Introduction

The Pravdinsk reservoir is situated in the Pravdinsk district of the Kaliningrad region, on the Lava River, and spreads from south to north. The length of the Russian part of the reservoir is 12.6 km, total is 32 km. Average depths are 3–4 m. The reservoir has a highest fisheries category. Recreational potential is not used enough, tourism infrastructure is not developed. According to recent studies, the reservoir is recommended for the organization of lake and industrial (cage) commercial fish farming, as well as for the organization of sports and amateur (recreational) fishing. According to the importance of the water body, the aim of the work was its complex ecological assessment using hydrochemical, radioecological and hydrobiological indicators.

2. Materials and methods

Investigations of the Pravdinsk reservoir ecosystem were carried out once a season. In 2017–2019 hydrochemical, radioecological (water, bottom sediments, hydrobionts), hydrobiological (bacterioplankton, phytoplankton, zooplankton, benthos) studies of its water area were investigated. The ichthyofauna research, as well as the monitoring of the epizootic state and parasitic safety of the fish of the Pravdinsk reservoir were done.

3. Results and Discussion

According to the results of the studies, the radiation situation in the Pravdinsk reservoir can be considered as safe. The ^{137}Cs content in the water body was 0.2–5.9 Bq/m^3. It is currently at the background level which established in flowing freshwater bodies of the European territory of Russia. The content of ^{90}Sr in the water body on average was 2.7 Bq/m^3. This value was lower than the average volumetric activity of ^{90}Sr in the water of rivers in the European territory of Russia, which, according to the NPO «Taifun» of the Russian hydrometeorological center in 2007–2018, was 4.2–5.2 Bq/m^3.

For a number of hydrochemical parameters it was found that the maximum allowable concentrations exceeded for fishery water bodies.

According to the results of microbiological studies, the water of the Pravdinsk reservoir can be assessed in winter and spring seasons as slightly polluted β–mesosaprobic 3 class of purity, in summer

*Corresponding author.
E-mail address: phytob@yandex.ru (O.A. Dmitrieva)

and autumn – as polluted β, α–mesosaprobic 3–4 classes of water purity. The average values of the index of total coliform bacteria exceeded the values established for reservoirs suitable for recreational use and within the boundaries of populated areas by 1.2 times (total coliforms (TC) = 594 colony forming unit (CFU)/100 ml), faecal coliforms (FC) by 4.4 times (437 CFU/100 ml), which indicates a high level of pollution of the reservoir by wastewater. The values of the index of the ratio of the number of fecal coliforms (FC) to fecal streptococcus (FS) (FC/FS index = 1) characterize the nature of the effluents as agricultural.

The phytoplankton was mostly represented by 138 species, these were mainly diatoms, and the role of Cyanobacteria was increased in the summer. During the study period, more than 70 species were found in the zooplankton of the Pravdinsk reservoir, most of species belonged to Rotifera and Cladocera. In August 2018 “bloom” of water by Cyanobacteria (species of the genus Microcystis) was indicated, while the maximum proportion of dead individuals in zooplankton was observed. During the same period the acute toxic effect of water from the Pravdinsk reservoir on the test organisms *Daphnia magna* and *Ceriodaphnia affinisis* was observed and phytoplankton consumption by zooplankton was low. In the zoobenthos communities the most abundant were Tubificidae, Chironomidae (larvae), Mollusca and Hirudinea.

The abundance and biomass of phytoplankton, zooplankton and benthos increased from winter to summer, and decreased by autumn. According to the biomass of zooplankton in the summer of 2017 and 2019, the Pravdinsk reservoir can be classified as an average food value reservoir, in 2018 – as a reservoir with a food value above average. According to benthos biomass, the reservoir is estimated to be quite high food value.

The ichthyofauna of the Pravdinsk reservoir included 14 species of fish. The Cyprinidae were represented by 9 species, Percidae – 3 species, Esocidae and Gadidae – 1 species.

The fauna of parasites of 6 species of fish (roach, bream, silver bream, perch, pike perch, tench) was investigated. A total of 254 specimens of fish were examined for the presence of parasites, both pathogenic to humans and non-dangerous extrinsic species. There were found 11 parasite species belonging to 6 systematic groups: Microsporidia (1 species), Myxosporidia (2), Trematoda (4 species), Cestoda (1), Hirudinea (1) and parasitic Crustacea (2). The highest rates of infestation (Prevalence 50-100%) were observed for metacercariae of Trematodes. Pathogenic for human health metacercariae *Apophallus miiehlingi* were found on the body surface and musculature of roach and perch.

4. Conclusions

The studies have made it possible to recommend the Pravdinsk reservoir for organizing tourism infrastructure. The reservoir can be used both for recreational purposes and for recreational fishing and for the development of fish farming, what has been shown in the previous studies (Yusupova and Hajnowsky, 2018).

References

Yusupova D.I., Hajnowsky K.B. 2018. Research results of the Reservoir «Pravdinskoe» (Kaliningrad Region) for definitions of use opportunities commodity aquaculture. Molodezhnyy Nauchnyy Vestnik [Youth Science Bulletin] 2(14): 1-6. (in Russian)